CLAIMS

What is claimed is:

1. A semiconductor laser, comprising:

a first optical gain element that generates a first light beam having a first optical frequency;

a second optical gain element that generates a second light beam having a second optical frequency;

an optical frequency mixer that is coupled to said first and second gain elements and generates a polarization wave at a third optical frequency; and

a near-field phase grating that couples a power from the polarization wave to an electromagnetic wave propagating at the third optical frequency.

2. The laser of claim 1, wherein the third optical frequency is in the mid-infrared, long-infrared or Terahertz regions.

3. The laser of claim 1, wherein said optical frequency mixer includes a waveguide optically coupled to said first and second gain elements.

4. The laser of claim 1, wherein the electromagnetic wave propagates in a direction essentially perpendicular to a propagation direction of the first and second light beams.

5. The laser of claim 1, wherein the semiconductor laser is fabricated with group III-V material.

6. A semiconductor laser, comprising:

a first optical gain element that generates a first light beam having a first frequency;

a second optical gain element that generates a second light beam having a second frequency;

mixing means for mixing the two light beams to create a polarization wave at a third optical frequency, and;

means for coupling a power of the polarization wave to an electromagnetic wave propogating at the third optical frequency.

7. The laser of claim 6, wherein the third optical frequency is in mid-infrared, long-infrared or Terahertz regions.

8. The laser of claim 6, wherein said mixing means includes a waveguide for mixing said first and second light beams.

9. The laser of claim 6, wherein the electromagnetic wave propagates in a direction essentially perpendicular to a propagation direction of the first and second light beams.

10. The laser of claim 6, wherein the semiconductor laser is fabricated with group III-V material.

11. A method for operating a semiconductor laser, comprising:

generating a first light beam having a first optical frequency;

generating a second light beam having a second optical frequency;

mixing the two light beams to create a polarization wave at a third optical frequency, and,

coupling a power of the polarization wave to an electromagnetic wave propogating at the third optical frequency.

12. The method of claim 11, wherein the third optical frequency is in the mid-infrared, long-infrared or Terahertz regions.

13. The method of claim 11, wherein the first and second light beams are mixed in a waveguide.

14. The method of claim 11, wherein the electromagnetic wave propagates in a direction essentially perpendicular to a propagation direction of the first and second light beams.